Goddard Space Flight Center SPI

GSFC

Software Configuration Management

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Software Process Improvement (SPI) Project

Agenda

- Configuration Management (CM) Background
  - CM Concepts
  - CM Benefits
  - Process Overview
- Configuration Management Implementation
  - Planning and Startup Tasks
  - Execution Tasks
- CM Support Information

Purpose and Objectives

- **Purpose: Describe CM Concepts and the implementation approach**
- **Objective: After this session you should understand:**
  - **Four key functions of CM**
  - **How to apply CM to your project**
  - **Which CM records to maintain**
  - **Where to find additional information on CM processes and tools**

Configuration Management Overview

- **The purpose of Software Configuration Management (CM) is to establish and maintain the integrity of products throughout the software life cycle**
- **Software CM involves four key functions:**
  1. ***identification*** **of work products and baselines that are subject to configuration control**
  2. ***control*** **(i.e., approval/rejection) of proposed changes to configuration items**
  3. ***status accounting*** **of configuration data and changes**
  4. ***audits*** **to maintain the integrity of the configuration baselines**

CM Benefits

- Improves
  - Product protection
  - Product visibility
  - Product control
  - Team communication
  - Customer Confidence
- Decreases
  - Rework
  - Confusion
  - Project Risk

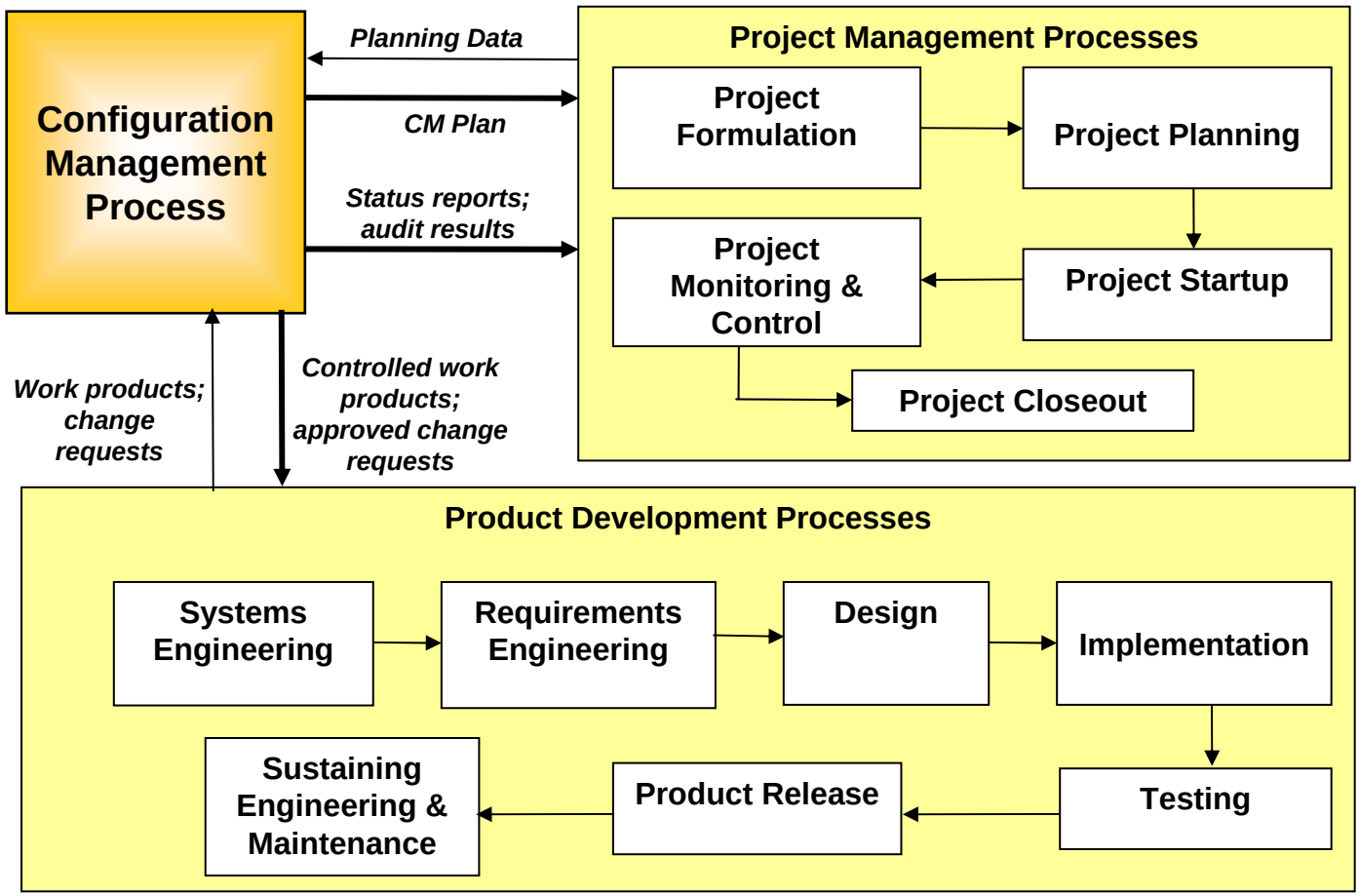
Key Definitions

- **Configuration Item (CI) - an aggregation of work products (e.g., hardware, software, firmware, or documentation) that is designated for configuration management and treated as a single entity in the configuration management process**
- **Baseline – a set of specifications or work products that has been formally reviewed and agreed on, which thereafter serves as the basis for further development, and which can be changed only through change control procedures. *Typically* defined for each project life-cycle phase**

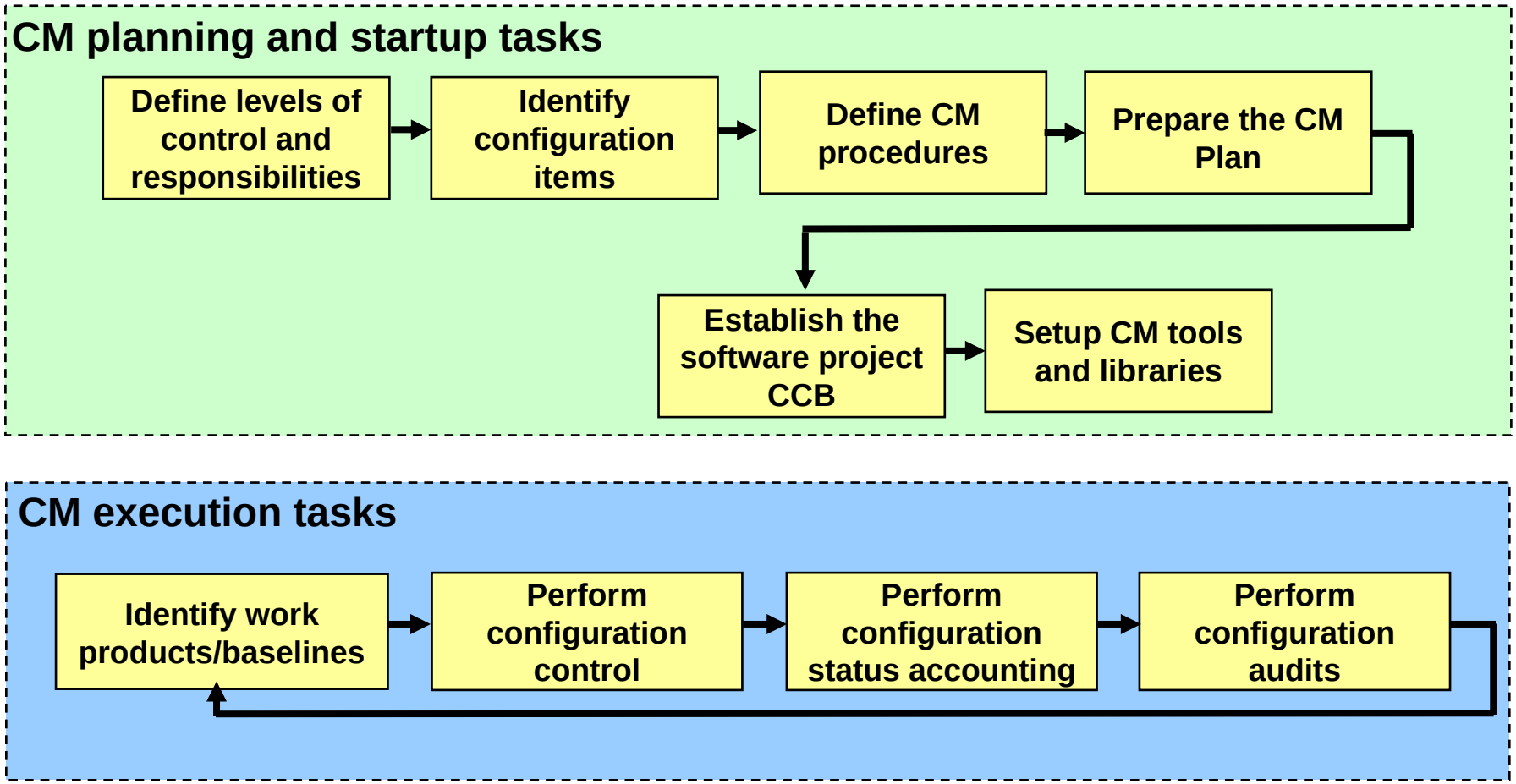
Configuration Management Roles
and Responsibilities

- **Product Development Lead (PDL) - Responsible for CM planning and overall control and approval of CM activities and tools. Develops and maintains the project's CM Plan**
- **Configuration Management Officer (CMO) – Implements and maintains the CM system according to the project's CM Plan. Coordinates, supports, and performs CM activities and reports those activities to the PDL**
- **Control Board – composed of technical and administrative representatives who recommend approval/disapproval of changes to a CI or baseline (e.g., Configuration Control Board (CCB), Internal Review Board (IRB))**

Configuration Management Process Overview

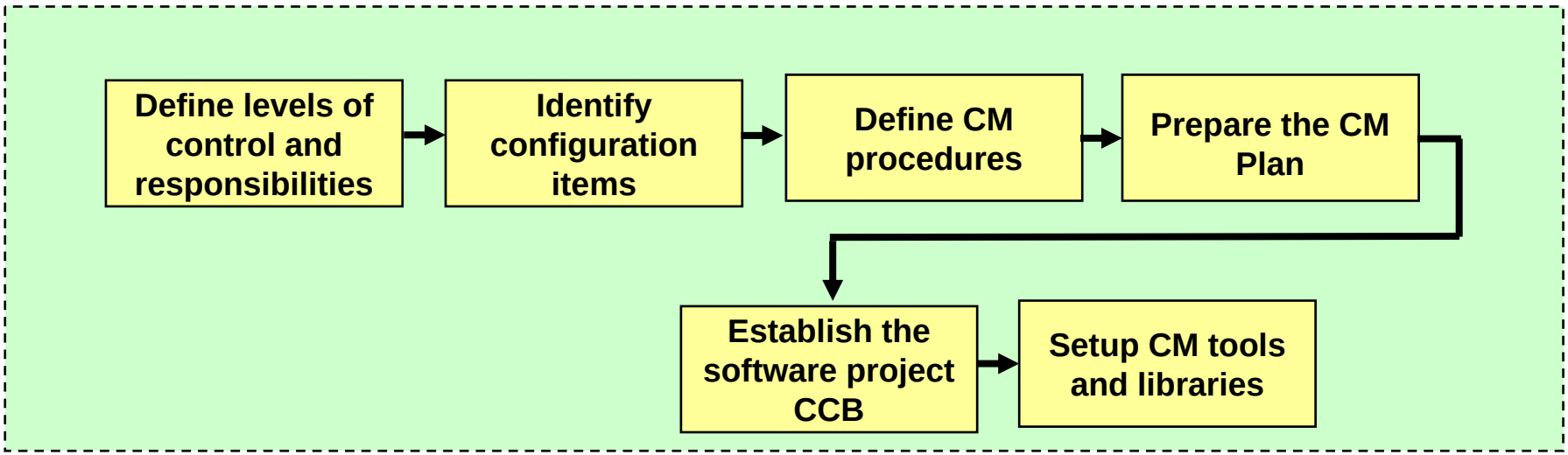


Configuration Management Tasks



NOTE: See the ISD Software Configuration Management Asset, 3.1, for complete task descriptions

CM Planning and Startup Tasks



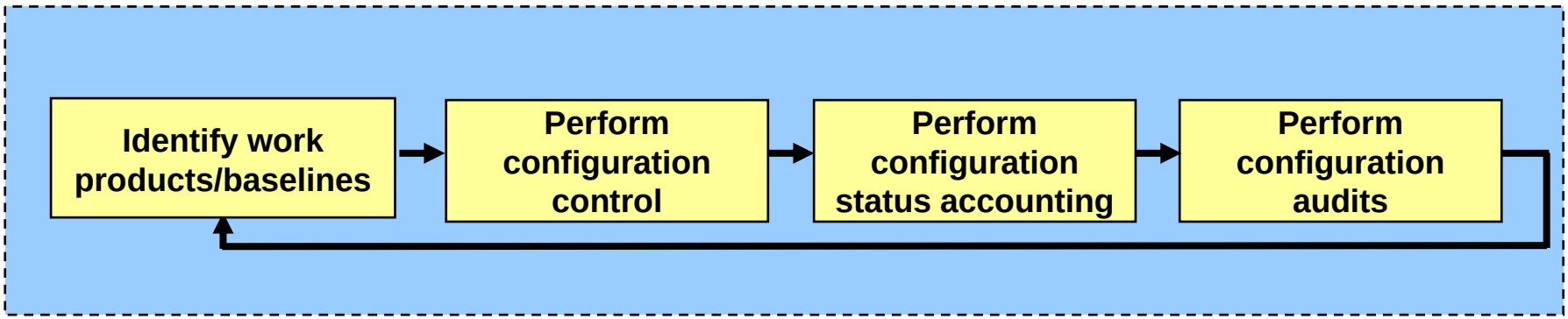
CM Planning/Startup Tasks (1 of 2)

- Identify the CIs (e.g., deliverable products, interim products, requirements, software) and define the naming conventions
- Identify the levels of control for each CI
- List the identified items in the data management list (DML)
- Determine when each item will be placed under configuration control (i.e., Baselined)
- Select a role that is responsible for maintaining the integrity of items under CM
- Establish a CCB or IRB to manage, assess, and control changes to configured items

CM Planning/Startup Tasks (2 of 2)

- Define the mechanism used to control changes
  - Change requests (e.g., What forms / tools will be used?)
  - CCB / IRB (e.g., What meetings (if any) will be held? How will changes be dispositioned, logged, and tracked?)
  - Audits to confirm the approved changes and ensure the integrity of the configuration baselines
- Identify tools used to support CM and how they will be used (e.g., MKS, CVS, ClearCase)
- Document approaches, procedures, and tools in a separate CM Plan or as part of your SMP/PP

CM Execution Tasks



1 - Configuration Identification
Identify Work Products and Baselines

- **Document the baseline items in the "Baselines Table" in the SMP/PP**
- **Identify by phase (per your life cycle model) the CIs that will be baselined or re-baselined**

Items	Org.	Concept	Requirements	Design	Implementation	System Testing	Acceptance Testing	Operations
Date of baseline:								
SMP/PP	P	•	•					
Configuration Management Plan	P	•	•					
Test Plan	P	•	•					
Software Requirements Document	P		•	•				
Simulator Design	P			•	•	•	•	•
Simulator models	P			•	•	•	•	•
Simulator Software	P			•	•	•	•	•

Go to http://software.gsfc.nasa.gov/tools.cfm and look for "CM Baselines Template"

Recording the Baselines

- **Update the "Baselines Table" at the conclusion of each phase to record the baseline date and the baseline versions for each configured item**
- **Save your updated "Baselines Table" as specified in your DML**

Items Date of baseline:	Org.	Concept 3/1/07	Requirements 6/1/07	Design	Implementation	System Testing	Acceptance Testing	Operations
SMP/PP	P	V1.1	V1.1					
Configuration Management Plan	P	V1.0	V1.2					
Test Plan	P	V0.1	V0.5					
Software Requirements Document	P		V1.0	•				
Simulator Design	P			•	•	•	•	•
Simulator models	P			•	•	•	•	•
Simulator Software	P			•	•	•	•	•

Document CIs in Data Management List (DML)

Data Management List (DML)

Title (must add links to the documents in the delivered PAL)	Description / Notes	Created by/ Responsible for updates	Level of Control	Location (Project name)/Folder below OR Server OR URLs	Primary Process Area	Frequency of update/creation	Current Version Number	Current Version Date	ITAR Sensitive?	PPQA Evaluation Required?	FY 2007 (sample entries/checks for 1st) Quarter 1	Quarter 2	Quarter 3	Quarter 4
Data Management List (DML) (this list)	This is important to Planning, Monitoring and Control and CM	PDL	Version	02 Project Management	PP	As needed			N		✓			
CM/DM Plan	See Product Plan section x.x *(or this could be a separate plan)*	CM Lead	CCB	05 CM Materials	PP	Annual			Y	Yes		✓		
Project Plan		PDL	CCB	02 Project Management	PP	Annual			Y	Yes		✓		
Acquisition Management Plan	See Product Plan section x.x *(or this could be a separate plan)*	PDL	CCB	02 Project Management	PP	Annual			Y	Yes		✓		
Schedule	Schedule, notes and inputs to schedule in the form of redlines/emails	PDL	Version	M										
Estimates with Basis of Estimates	Includes software and workproduct size estimates, effort estimates, staffing, schedule estimates and basis for all	PDL	Version	M										

Data Management Monitoring Log

Instructions for Use: Enter observations regarding expected data vs. what is found. Ensure items are in correct locations in repository, items expected are present, and that items not expected are either added to the data management list or are removed from the repository. At a minimum, some data items should be reviewed quarterly, and all items should be reviewed at least annually.

Date	Name	Data Management Monitoring Log
10/2/2006	*Casto*	*Reviewed contents of "02 Project Management" folder. ABC development team status reports missing. Carly Simon has found them and placed them in the folder.*
6/1/2006	*Page*	*Reviewed meeting minutes folder -- "05 Meeting Minutes". No problems found.*

Go to http://software.gsfc.nasa.gov/tools.cfm and look for "Data Management List"

2 - Configuration Control

- Identify and record desired changes to a baselined item
- Define the need / problem rather than the desired resolution
- Document the analysis of change
  - Impact analysis, costs, urgency…
- Review and disposition each change request
- Use a tool* to record and track the status of all change requests

*Go to http://software.gsfc.nasa.gov/tools.cfm and look for “Change Request Form” and “Change Request Log Template”

Change Request Form and Log

Change Request Form

Requestor fills out this section

Project:

System(s)/subsystem(s):

Requestor:

Name: Date initiated:

Urgency:

☐ Routine
☐ Urgent

Item type:

☐ Requirement
☐ Document
☐ Process

Current version of item:

Item number (if appropriate):
Description of existing item (enter "none" if request is for a new item):

New version of Item:

Description of new version of item (enter "delete" to delete an item):

Suggested new item number (optional):

Rationale:

Describing the desired change

Change Request Form

This section for project use only

Request Disposition:

Tracking Number: Date Submitted:

Analysis Assigned to: Date Assigned:

Analysis:

Impact:

Feasibility:

Disposition date:

Result:

☐ Accepted
☐ Accepted with modification

If accepted with modification, describe the modification:

☐ Rejected

If rejected, rationale for rejection:

Signature:

Approved or rejected by: Date:

Thoroughly analyzing the change

Decision and formal approval

Change Request Log

Project Name:

Tracking Number	Item Type	Systems/Subsystems	Short Description of Change	Urgency	Requestor	Date Submitted	Analysis Assigned To:	Result

Keeping track of all the desired changes

3 – Configuration Status Accounting

- Maintain records of the CIs throughout the project's life cycle
- Record and monitor all changes to CIs
- Document the contents of versions, builds, and baselines
- Generate periodic status reports – your CM tool may provide the reporting for you!

4 – Configuration Audits

- Conduct audits to maintain the integrity of the configuration baselines
- Three types of CM Audits are required:
  - Baseline Audit
  - Functional Configuration Audit (FCA)
  - Physical Configuration Audit (PCA)
- Audits correspond to major milestones and must be planned and on your schedule

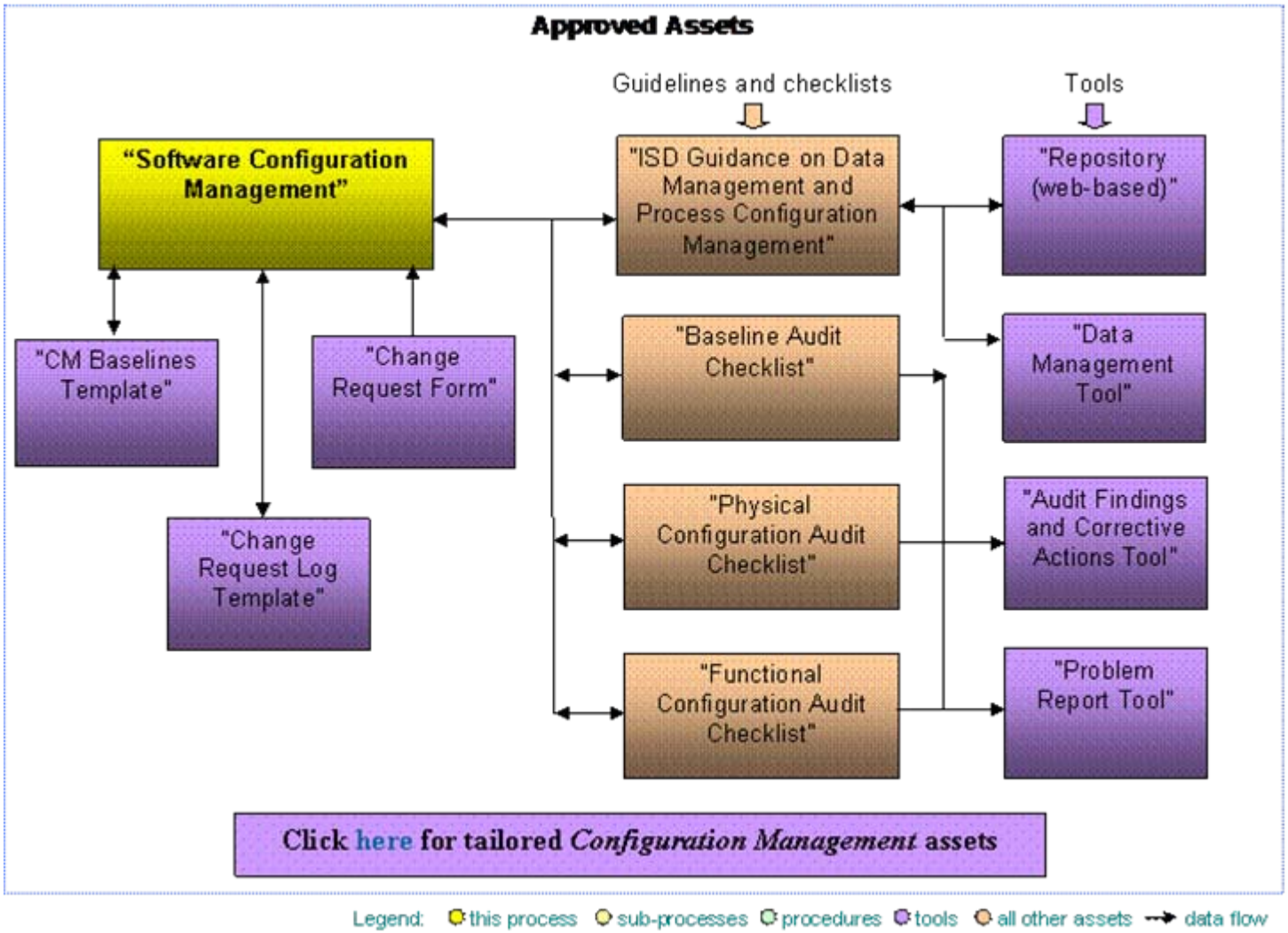
Baseline Audit

- Conducted at the end of each life cycle phase or at each major delivery
- Conducted by the team's CMO or designated team personnel; reviewed by the team's Software Quality Engineer (SQE)
- Baseline Audit -- verifies the content of the baseline
  - Correct versions of CIs were used to build the baseline
  - Correct version of documentation are included in the baseline

FCA and PCA

- **Functional Configuration Audit (FCA) -- Verifies functionality of baseline after final testing**
  - **Ensures that CIs achieve the performance and functional requirements**
  - **Ensures that operational and support documents are complete and satisfactory**
- **Physical Configuration Audit (PCA) -- Verifies content of baseline for major builds or deliveries**
  - **Ensures that baseline items of a delivery match the documentation that defines it (e.g., Version Description Document (VDD), design documents)**
- **Both conducted by the team's CMO or designated team personnel; verified by the team's SQE**

CM Assets
Procedures, Guidelines, and Tools



Go to http://software.gsfc.nasa.gov/process.cfm and look under "Organizational Support"

CM Records

- **CM Plan (including responsibilities, approach, baselines, and CI naming conventions)**
- **Schedule of CM activities**
- **Evidence of Change Request (CR) handling, assignment, and tracking – following the full thread thru the CM process**
- **CCB agendas and meeting minutes**
- **VDDs and/or Delivery Letters**
- **CM audit results**
- **Emails communicating audit results, configuration problems, distribution of the Plan, CRs emailed for analysis, summary of open CRs…**

Summary

- **Software Configuration Management establishes and maintains the integrity of products throughout the software life cycle**
- **CM planning and implementation support include:**
  - **Configuration Identification**
  - **Configuration Control**
  - **Configuration Status Accounting**
  - **Configuration Audits**
- **CM records must be organized and maintained**

Questions?

Acronyms

CCB	Configuration Control Board
CI	Configuration Item
CM	Configuration Management
CMO	Configuration Management Officer
CR	Change Request
DML	Data Management List
FCA	Functional Configuration Audit
IRB	Internal Review Board
ISD	Information Systems Division
PCA	Physical Configuration Audit
PDL	Product Development Lead
SMP/PP	Software Management Plan/Product Plan
SPI	Software Process Improvement
SQE	Software Quality Engineer
VDD	Version Description Document